

Flightfax

ARMY AVIATION
RISK-MANAGEMENT
INFORMATION

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Post-Crash *Fires:* a deadly **Hazard**

Flightfax

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RISK-MANAGEMENT
INFORMATION

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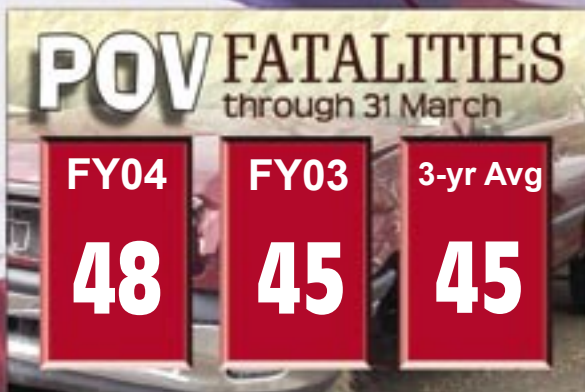
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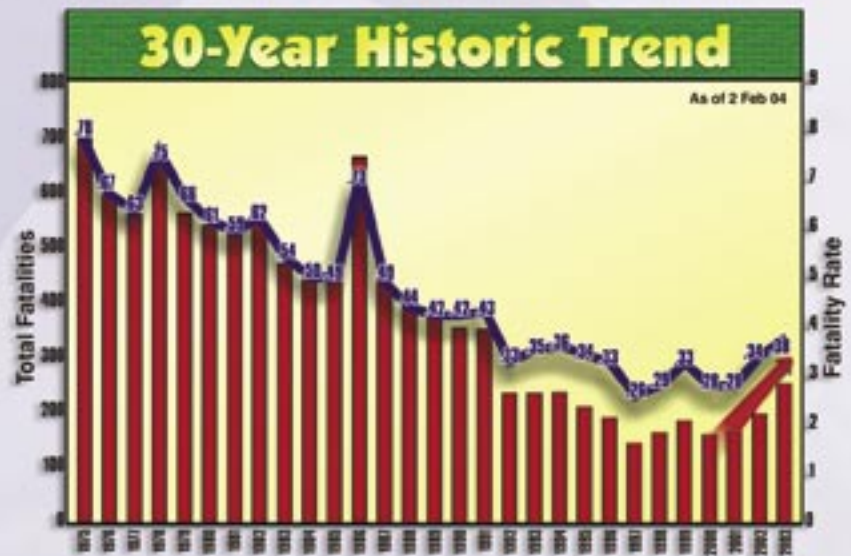


Why Paragraph 6 Won't Cut It Anymore

The steady reduction in Army accidental fatalities between 1975 and 2000 is one of the Army's true success stories. During these years, we came to recognize that protecting Soldiers' lives was vital to preserving our combat readiness. As an Army, we developed a series of programs designed to aggressively attack the three main accident categories: materiel failure, environmental conditions, and human error. During those 25 years, safety modifications to our equipment have made materiel failures extremely rare. In addition, aggressive research programs and control measures have radically decreased the number of accidents caused by environmental conditions. The most significant factor was the emphasis on safety by senior leadership. That emphasis resulted in a decrease in the number of Army accidents caused by human error.

Since Fiscal Year 2000, the Army has experienced a troubling increase in accidental fatalities. The number of environmental and materiel causes remains low, and senior leadership emphasis continues to be strong. In fact, senior leaders are energizing the system to promote risk management. The major commands are actively involved, and their safety programs have some great initiatives. So where are we falling short? Clearly, the Global War on Terrorism has increased our Soldiers' exposure to risk as they conduct 7-day-a-week operations throughout 120 countries. But there is more to the story . . .

A careful study of the root causes of Army accidents over the last 12 months has identified a glaring trend: the failure of junior leaders to properly manage risk. Company-level planning and troop-leading procedures routinely fail to mitigate our most basic hazards. In the air, crews conducting pre-mission planning are not properly identifying wire hazards. In a 6-week period, we had four wire strikes and three destroyed aircraft, which resulted in six fatalities. On the ground, junior leaders are not following troop-leading procedures and, therefore, recons, pre-convoy inspections, and rollover drills and rehearsals are not mitigating risks. In the last 3 weeks three HMMWVs, an LMTV, and an M2 Bradley have experienced rollover accidents that resulted in six fatalities. Whether it is a platoon leader who fails to properly reconnoiter and supervise mission planning or a squad leader who fails to demand his soldiers wear seatbelts and not speed, most accidents can be prevented by basic actions at the junior leader level.



8 Troop-Leading Procedures

1. Receive the mission.
2. Issue the warning order.
3. Make a tentative plan.
4. Start necessary movement.
5. Reconnoiter.
6. Complete the plan.
7. Issue the complete order.
8. Supervise.

Operations Order

1. Situation.
2. Mission.
3. Execution.
4. Service support.
5. Command and signal.
6. Oh yeah, what about safety?!?

So, is our junior leadership to blame? If so, then how have they performed so admirably in every other facet of the Global War on Terrorism? Why would their ability to conduct risk management be any different? The truth is, as an Army we have failed to teach and coach our junior leaders on how to properly mitigate risk. We give our future leaders 1 or 2 hours of classroom instruction and, 3 months later, expect them

to conduct risk management as a convoy commander in Baghdad. More often than not, the cadre at our schools complete the field training risk management plan without including their students in the process. How can we expect junior leaders to understand and use risk management if we don't give them the chance to practice it during their troop leader procedure training? Simply put, we can't.

How are we doing in the field? We are not teaching our junior leaders the right lessons. We teach them that risk management is, literally and figuratively, paragraph 6 of their operations order—an *afterthought*. By this, they infer safety is a restriction to their training or mission. However, when safety is embedded early in the mission-planning process, the unit

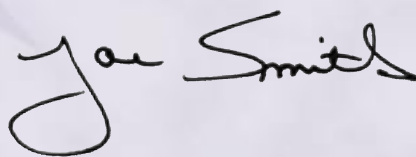
can implement better control measures and conduct more challenging training.

Safety is not about being risk averse. It is about mitigating risk so everyone makes it home from a hard mission to fight another day. Our most powerful control measures are standards and discipline. Special Operations forces regularly conduct complex missions around the world, but do so with one basic premise: do the basic things right. Just by doing the basics to standard, any unit can make the tough jobs look simple. This is the attitude we need to instill in our Soldiers, especially our junior leaders.

The Safety Center is actively working with Training and Doctrine Command (TRADOC) to improve the quality of risk management training by taking it out of the classroom and embedding it into troop leading and field training. Furthermore, we are developing videos and interactive tools to improve our leaders' understanding of how to use our ASMIS-I, RMIS, and ARAS tools to conduct better risk management. In the interim we need every Soldier, regardless of rank, to stop treating risk management as an afterthought. As GEN Schoomaker has repeatedly stated, "We cannot afford to be risk averse, but we must be smart about managing our risks."

In 1992, the introduction of the 5-step risk management process resulted in an immediate reduction in Army accidents. Former Army Chief of Staff GEN Dennis Reimer's emphasis on reducing off-duty accidents in 1997 had a similar positive impact. These initiatives were successful because they inspired an immediate culture change. To curb the current accident trends and make the Army Safety Campaign a success, we also must inspire a culture change in the way we view risk management.

Our Army is at war. Be safe and make it home!



LTC Anthony W. Potts
Product Manager for Apache Modernization
and Recapitalization, PEO-Aviation

APU Clutch Failures Cause Damage in Apaches

It was a routine flight over the northern part of Iraq, or at least as routine as combat patrols had become during Operation Iraqi Freedom (OIF). Apache XX-05219 was in the traffic pattern setting up a downwind to final approach. However, this flight was soon to become anything but ordinary.

The crew was alarmed by an unusual growling noise coming from the aircraft. The growling sound was followed immediately by aircraft vibrations.

Within the cockpit, through the hearing protection afforded by the integrated helmet and display sighting system (IHADSS) and over the drone of the engines and rotors, the crew detected a rhythmic thumping sound. The sound was accompanied by small impact tremors that seemed to coincide with the thumping.

Within 60 seconds of the first indications, the crew received an APU FIRE light, followed by an AFT DECK FIRE message. The situation worsened immediately. The ENG FIRE 2 light illuminated on the caution warning

panel. Ground observers confirmed the worst; flames were seen trailing out of the back of the aircraft. Crash rescue rolled to the runway to await the stricken aircraft.

Ground observers confirmed the worst; flames were seen trailing out of the back of the aircraft. Crash rescue rolled to the runway to await the stricken aircraft.

The crew turned to set up a roll-on landing to get the aircraft on the ground as quickly as possible. The crew had the aircraft on the ground in less than 2 minutes after the first indications. At that time flames were rolling from the aft catwalk area. The crew exited the aircraft, and the crash rescue team worked to extinguish the fire. The once-amazing Longbow Apache sat on the runway, fire extinguished, but burned almost completely in half just aft of the main transmission.

While conducting a mission in the vicinity of Balad Army Airfield (AAF) 6 days later,

the crew of Apache XX-05211 received an APU FIRE warning light, followed by ENG 1 and ENG 2 FIRE advisory lights. The crew attempted to return to a safe area around Balad AAF. The wingman notified 211's crew that there were smoke and flames coming from the aircraft. The crew accomplished a controlled landing close to friendly forces and egressed the aircraft. Post-landing fire consumed almost all of the aircraft.

COL Ralph Pallotta, Apache Project Manager (PM), was notified within hours of the incident. He immediately stood up a Tiger Team that would be dedicated full-time to resolve the problem. I was selected to lead the Tiger Team. The mission was to determine the cause of the failures, provide an analysis of the associated risks, develop a fix, write the safety-of-flight (SOF) message, and ensure the logistics provisions were developed in parallel. We then were to export the fix to the field as rapidly as possible.

The situation that made this issue different from most other SOF issues was that we were at war. Since we were at war, the PM office had to find a solution without taking the aircraft out of the fight. The mere presence of the Apache on the battlefield caused rebel forces to retreat to safe havens. There was little doubt the Apache mission during combat escort or on border patrol prevented the loss of life every day in the Iraqi and Afghan theaters of operation. We had to work fast to keep the fleet in the air, yet do everything possible to minimize the risk to our crews.

The Tiger Team was comprised of the Project Management Office; Aviation Engineering Directorate; Integrated Materiel Management Center; Defense Logistics Agency (DLA); U.S. Army Aviation and Missile Command; Boeing Engineering; and Honeywell (who builds the APU clutch).

The investigation immediately focused on the APU clutch as the probable cause of the aircraft fire. A safety investigation determined that the APU clutch seized, and part of the APU clutch housing broke away from the APU. Connected to the end of the #7 driveshaft and spinning at 8,200 RPM, the broken housing began to beat violently throughout the engine

deck. Fuel and hydraulic lines were severed, and the sparks generated by the metal-to-metal contact ignited the flammable liquids.

Because of the extent of the damage, the root cause of the failure was extremely difficult to determine. However, we have a very good understanding of the conditions that contributed to the catastrophic failure of three APU clutches that led to extensive damage to three Apache aircraft (two D models and one A model).

As the investigation unfolded, we focused on

the elements that were common to all three failures. The obvious factors were that all aircraft were operating in a desert environment. Potentially damaging elements associated with desert environments include sand and dust, along with periods of extreme solar heating. Interviews with field commanders also revealed that desert combat operations required extensive runtime on the APU. Indications were that APU runtime in the desert was as much as six to eight times what is experienced during peacetime operations.

We looked at some of the other countries that flew in similar environments to determine if they had experienced similar problems and, if so, what they were doing about it. We found that the Israeli Air Force had several clutch failures early in the life of their program (although not catastrophic), and had reduced their time before overhaul (TBO) on their

A safety investigation determined that the APU clutch seized, and part of the APU clutch housing broke away from the APU. Connected to the end of the #7 driveshaft and spinning at 8,200 RPM, the broken housing began to beat violently throughout the engine deck. Fuel and hydraulic lines were severed, and the sparks generated by the metal-to-metal contact ignited the flammable liquids.

clutches to 250 hours. They also believed their failures were caused by high temperatures combined with extended runtimes.

We had seven clutches flown back from the OIF theater for immediate evaluation. On some clutches, we found that much of the grease was gone from the output duplex bearing. In some clutches there was evidence of heat discoloration. We also noted that some of the seals that separate the input and output sections of the clutch were damaged or weren't positioned properly, allowing oil to flow from the input to the output section, which can wash the grease away from the bearing.

Given these factors, we concentrated our efforts on the aircraft with the highest-time clutches. The team developed a procedure to allow disassembly, inspection, and repack of the grease in, or conditional replacement of, the duplex bearing in the field. While empirical data indicated that about 375 hours of "recorded" flight time on a clutch seemed to be the danger zone for this failure mode, there were sufficient outlying data that caused us to take a more conservative approach to mitigate the risk of a catastrophic clutch failure. It was decided to conduct the inspection at 125-hour intervals.

To establish the proper logistic trail, we ordered special tool kits required for the disassembly, including arbor presses, bearing repack and replacement kits, and additional duplex bearings, to name a few. Initial training was conducted at the Honeywell facility in a "train-the-trainer" fashion, and then training teams were dispatched to Apache users all over the world. Once all training was complete and tools and kits were on hand, we released the SOF, which minimized risk and still provided commanders with operational flexibility to continue their missions. The SOF used a time-phased approach that concentrated on the greatest-risk aircraft first (those with 375 or more hours on the APU clutch), and then required inspections on all remaining aircraft, reducing the hour requirement by 125 hours every 20 days until the fleet was completed.

To date we have shipped over 1,100 kits

to the field. There have been no reported incidents of APU failures once the SOF was applied. We are working to shift the responsibility to provide the repack and replacement kits to the DLA. Units will order the kits through standard Army supply channels beginning in the April or May 2004 timeframe.

Historically, the APU clutch has been problematic for the Apache. A Commercial Operation and Support Savings Initiatives (COSSI) program began in 2000 with the goal to build a clutch that was more reliable and would achieve a TBO of 1,500 hours (from the current 500-hour TBO).

The new COSSI clutch has six distinct improvements over the current APU clutch: grease-lubricated duplex ceramic ball bearings; a back-up bearing system; a shaft displacement detector to detect worn primary bearings and loss of centerline; an improved seal system to preclude seal contamination; a torque limiting control valve for "softer" engagements; and an aluminum input housing and steel output housing.

The new COSSI clutch was completed in the fall of 2003. We immediately began to fly it on aircraft at Fort Rucker, AL, where we have over 300 hours of time on the first clutch with no known problems. The initial TBO is set for 750 hours, with plans to extend it out to 1,500 hours once we gather enough field data to support that decision. The APU clutch SOF does not apply to the new COSSI clutch.

The original plan was to field the COSSI clutch beginning in January 2004 and continue through 2010. However, the PM made the decision to accelerate that fielding schedule to have the entire Army fleet retrofitted not later than July 2005. All Longbow Apaches coming off the assembly line have the new COSSI clutch. Accelerated field retrofits began in February 2004. We are rapidly fielding the clutch to the Operation Enduring Freedom and OIF theaters of operation and will continue the fielding based on Army G-3 priorities. ♦

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EMERGENCY EGRESS

and some points to consider

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During an uneventful flight across Iraq, you notice anxiety building among the pilots of the UH-60 you're flying in. The cabin quickly begins to fill with smoke, and it's becoming extremely difficult to see and breathe. As the aircraft approaches its intended landing point, it becomes apparent that you're going to land in a lightly wooded area. At this point, the crew chief shouts for you to assume a crash position and prepare for a rough landing.

As the aircraft settles into the trees, you hear blades and fuselage breaking through the branches. All you can think about at this point is getting out of the back of this helicopter. The Black Hawk finally comes to a stop, but the cockpit is rapidly filling up with fumes. You manage to unbuckle, but you can't find an exit on the right side of the cabin where you were sitting. You realize the aircraft has landed on its right side, so those doors must be blocked. Your only option is to try and

find an exit on the left.

You feel your way around the other passenger seats, stumble to the forward portion of the cabin door, find the door handle, and pull. The door is jammed! Not to worry—the passenger briefing included emergency exit locations and you know where the cabin windows are located. But where are the emergency handles? You don't remember the crew briefing saying anything about the handle locations, but they must be near the door's rear because you saw some kind of handle in that location on the right side. No such luck. You feel your way forward along the cabin windows and finally find the handle. You pull the handle, but the windows stay in the same position. It must be malfunctioning.

Now what? You try pushing the window out with your arm. The window falls to the ground. You climb out, coughing up black smoke and gasping for clean air. You're out, but where is the rest of the crew? Oh yeah, the crew mentioned something about

a rendezvous point upwind of any fire and 50 feet from the aircraft. Since you're probably not of the mental capacity at this point to determine the wind direction, you just start walking.

Where is the rest of the crew? Looking back at the burning wreckage, you see movement in the aircraft. You don't recall the crew chief mentioning anything about a fire extinguisher, so how can you go back and fight the flames that are now starting to engulf the cockpit? Moments later, it's obvious that it's too late for the crew....

The crew brief is the place where our entire egress plan is finalized and committed to memory before we launch for the current mission. If we don't really think about what we've briefed or know how to execute the egress plan, we might create another chance to become injured or die after we've just survived an accident. The following are some actions regularly briefed by crewmembers that might be good examples of what NOT to do.

■ Typical egress procedures include exiting the rotor system at the left or right rear (where most aircraft operating manuals indicate the greatest rotor clearance is). This is only valid for an undamaged aircraft on flat terrain, not after the struts or skids have collapsed or when landing on sloping terrain. This could possibly be the worst place to go—you just survived the crash, only to lose your head during egress! The actual rotor system (or what is left of it) determines the safest place to exit.

■ The assembly point is 50 meters at 12:00; if 12:00 is unusable, then 3:00 followed by 9:00, then 6:00 as a last resort. Too much distance can delay the head count and lead to someone dying in the aircraft. Start the assessment of others onboard as you are unbuckling. If you notice no movement from some, then you should go to those passengers first. It's not good to make it outside and then realize someone is still onboard. Also, the further you go away from the aircraft, the greater your chances of getting lost or injured.

■ Another common action is to go upwind for the assembly point. After the crash, do I stick my finger

up to determine this, or do I remember Automatic Terminal Information Service

Always remember that the most important thing you can do is to actually practice your emergency plans and procedures. The time to discover that something won't work is during training, not during an actual emergency. You then can fine-tune your procedures for your area of operation and unit.

(ATIS) and use my compass? If it's a dark night, how do I determine wind direction? Rather than making laps around the aircraft or calling metro, keep it simple by starting with 12:00; if this is unusable, proceed clockwise to

the first good point. The first person to the assembly point then can use the whistle or strobe (for nighttime crashes).

There have been several accidents where the first people to assist the crew are either passengers or support personnel. Support personnel can be the hookup men for sling load missions, forward arming and refueling point personnel, pickup zone (PZ) control, or any other non-crew personnel involved with aviation operations. The information you brief to them may enable them to drag you out and save your life. Keep this in mind when you shut down at the PZ or landing zone to finalize plans before starting the operation.

Standardization and training also are important things to consider. If there is no egress plan in the standing operating procedures, then

you probably have as many procedures as you do pilots in command. This creates a problem for the other crewmembers because, under duress, which egress procedures will they follow? When training crewmembers, these tasks can be evaluated orally; but when you allow this, you must be sure they can perform it. About 90 percent of one unit's non-rated crewmembers could tell you the three steps for an emergency engine shutdown, but when asked to do it, only about 10 percent could.

As an example of crawl-walk-run, first have your crewmembers learn the three steps. Then, on a static aircraft, place the power control levers, fuel system selectors, and boost pump switches in the normal position for flight and have them perform the steps. Finally, during shutdown and after the cool-down period, have your crewmembers perform the steps as necessary.

Always remember that the most important thing you can do is to actually practice your emergency plans and procedures. The time to discover that something won't work is during training, not during an actual emergency. You then can fine-tune your procedures for your area of operation and unit. ♦

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Aircraft Hydraulic System

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Contamination of hydraulic systems has been identified as a possible cause of several aircraft incidents. It is an accepted fact that contamination shortens the service lives of hydraulic components. Finding a means of keeping water, air, and particulate contamination out of Army helicopter hydraulic systems is the goal of the Research, Development, and Engineering Command (RDECOM) Integrated Process Team (IPT) on aircraft hydraulic systems contamination control.

Important objectives of the IPT include the identification of equipment and procedures that will limit the introduction of contamination during servicing and maintenance. One of these initiatives is the addition of a new 2-gallon reservoir servicing unit (RSU) to all aviation unit maintenance (AVUM) No. 2 and aviation intermediate maintenance (AVIM) pneudraulics shop sets. The RSU's most significant improvement is seen when servicing the Apache.

The current method of filling the Apache reservoirs is to punch a hole in a 1-quart can of hydraulic fluid, insert a tube into the can, connect the tube to the FLUID FILL port on the manifold, and use the aircraft accumulator charging pump to fill the reservoirs. The problems with this approach are:

- The process of opening the can adds contamination to the oil.
- The tube, normally stored on the aircraft, will be dirty inside and out.
- Any unused fluid has to be returned to Hazardous Material (HAZMAT) for disposal at the installation level.

The RSU provides a quick and easy means

of filling aircraft reservoirs with hydraulic fluid that is clean, dry, and air-free. The RSU is sealed to allow storage of the hydraulic fluid over extended periods without picking up moisture from the surrounding air, thus eliminating the need to dispose of unused fluid. A 2-micron filter is installed in the output hose, which is flushed back into the unit's reservoir prior to each use. The return tube is transparent so fluid can be checked for air bubbles. The fluid is delivered at 4 cubic inches per stroke through the ground support equipment (GSE) return quick disconnect, so you don't need a wrench or Leatherman® to remove the cap on the 1/4-inch fill port.

The Program Manager (PM) for Aviation Ground Support Equipment (AGSE) is currently fielding initial-issue RSUs. Additional or replacement RSUs will be stocked under NSN 1730-01-504-5279. Normally doing a task by the book requires additional effort. Servicing the Apache reservoir with the RSU not only controls contamination, it also provides a quicker and easier way.

Other IPT initiatives are being applied to the aviation ground power unit (AGPU). An article in the July 2000 *Flightfax* discusses the importance of servicing the desiccant in the AGPU's vent dryer to keep humid air out of the reservoir. The PM-AGSE is currently investigating the installation of a water sensor to immediately warn the operator if the water content exceeds the 250 ppm limit. In addition, the AGPU's dual-service manifold is being modified to add aircraft-type quick disconnects to allow all AGPU hoses, to include the adapter hoses, to be flushed prior to connecting to an aircraft. These hose flush procedures are already in Change 8 to the AGPU's -12.

Finally, the IPT is addressing the third and possibly most-often ignored contaminant—*air*. Air can be just as harmful as the other forms of contamination. Long before there are any

ns Contamination Control

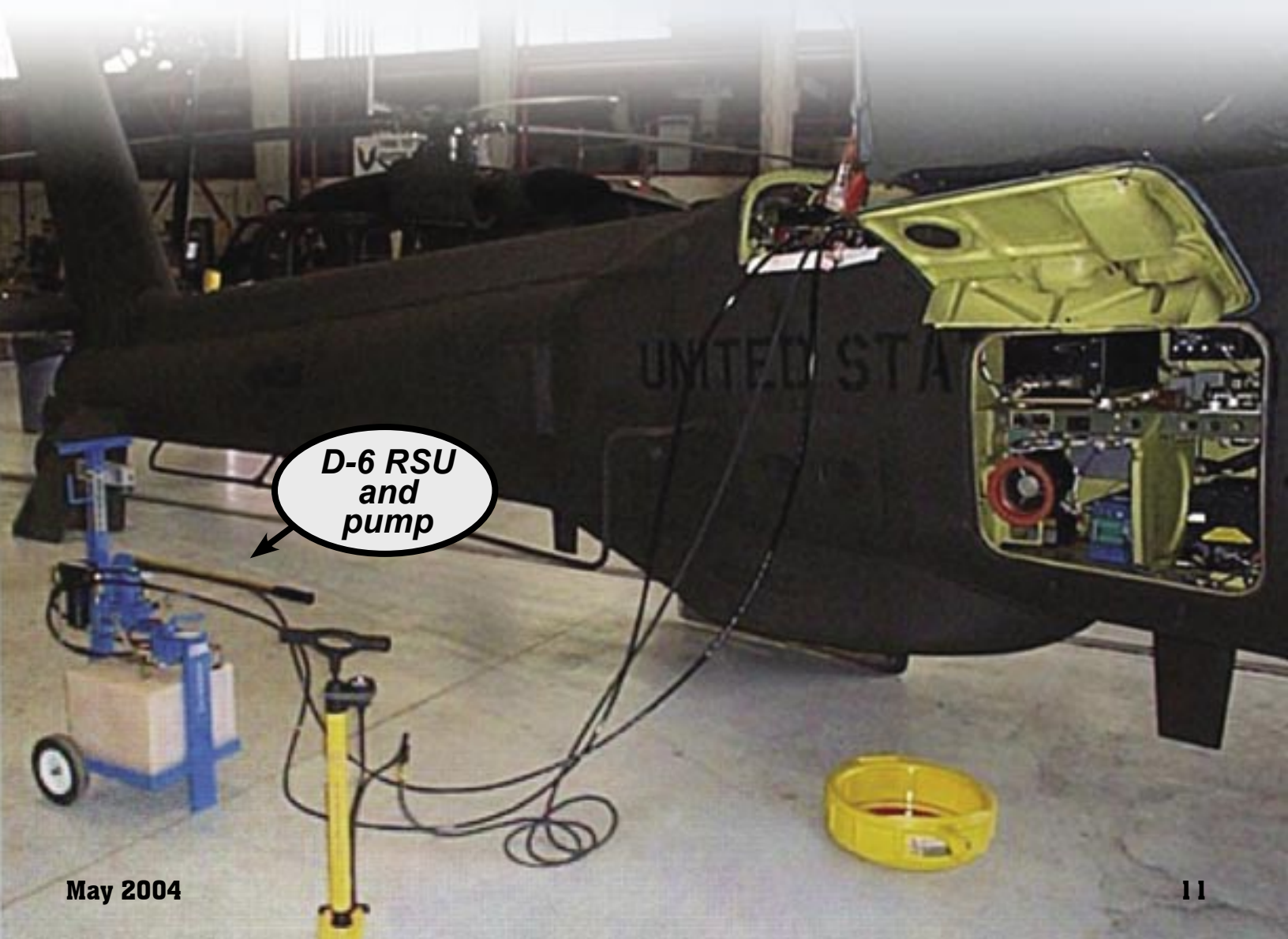
spongy controls or pressure fluctuations, air can cause overheating of hydraulic systems and cavitation of the high-speed pumps. IPT teams in the field sampling helicopter hydraulic systems have found evidence of excessive air contamination at an alarming rate. Even more alarming is the apparent lack of understanding of the issue by maintenance personnel. Except when quick disconnects are used, each time we open a hydraulic system we add air. Bleeding the hydraulics system of trapped air can be an easy task. Then again, there's the Apache.

The Apache has no push button to bleed air out of hydraulic fluid. The bleed procedures require the aircraft to be powered by the AGPU, allowing the bulk of the air to end up

in the AGPU's vented reservoir. Finally, any air trapped in the aircraft reservoirs can only be removed by overfilling. This is still the easy part. To drain the reservoirs back to operating level, you currently need both AGPU air and hydraulic pressure.

The IPT also is investigating the use of a high-pressure, manual hydraulic fluid dispenser and a hand air pump to perform this task. Our hope is that this cart will be as successful as the RSU in facilitating the essential bleeding of air from the Apache hydraulic systems in a quick and easy way. ♦

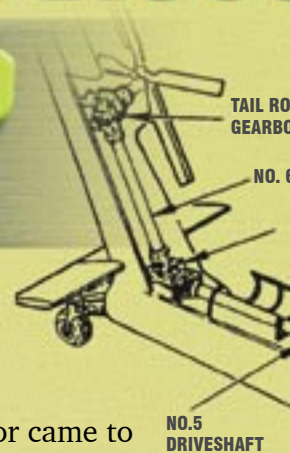
—For more information, contact the author by calling DSN 897-2350, ext. 9858 (256-705-2350, ext. 9858) or e-mail jerome.smith@rdec.redstone.army.mil. Mr. Smith works in the Aviation Engineering Directorate as a GSE Systems Engineer in Huntsville, AL.



Is the AH-64A/D Tail Rotor

A Fragile Thing?

CW4 Daniel R. Zimmermann
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Fort Rucker, AL



It was a warm spring afternoon in Illesheim, Germany, in 2000. The sun was shining and a warm breeze was blowing across the ramp in front of the hangar as Dave and Jeff headed out to the Apache they were going to perform a test flight on that day. It was one of those nice days, rare in Germany, that lull you into a comfortable routine. This day's last run-up would turn out to be anything but routine.

The day's flight was to have nothing to do with tail rotor driveshafts or input drive clutches. At least that's not what it started out to be. The aircraft was scheduled for rotor smoothing and had already been run-up and flown five times. The pre-flight checks and the pilot and co-pilot checks all went smoothly for the sixth flight. The aircraft was run-up to idle on the number one engine with the rotor blades turning at idle RPM.

During the number two engine start, initial indications were well within limits: the engine gas generator speed (N_G) was rising normally, the

turbine gas temperature (TGT) was on the rise, engine power turbine speed (N_P) was coming up, and torque was normal. The start sequence was almost complete when a sudden, violent explosion was heard in the crew stations that literally rocked the aircraft. The co-pilot in the front crew station was slammed side to side and from canopy to canopy as the aircraft shook from the explosion. The pilot's feet were knocked off the pedals as they violently cycled back and forth.

After the initial shock, the pilot heard a loud grinding noise just before he performed an immediate dual engine shutdown. A concerned crew engineer (CE) made his way to the pilot crew station to inform him that his tail rotor was not turning and they should not fly the aircraft. There was no doubt in both crewmembers' minds that they were not flying this aircraft after what they'd just experienced.

So, what did happen? The crew was performing an aircraft run-up and had one engine idle while the second engine was being started. After the initial

explosion the tail rotor came to a complete stop, as witnessed by the CE. Upon further inspection, the number four tail rotor driveshaft was found to have twisted apart just forward of the aft anti-flail assembly.

What is a driveshaft and how does it do its job of transferring engine power to the tail rotor?

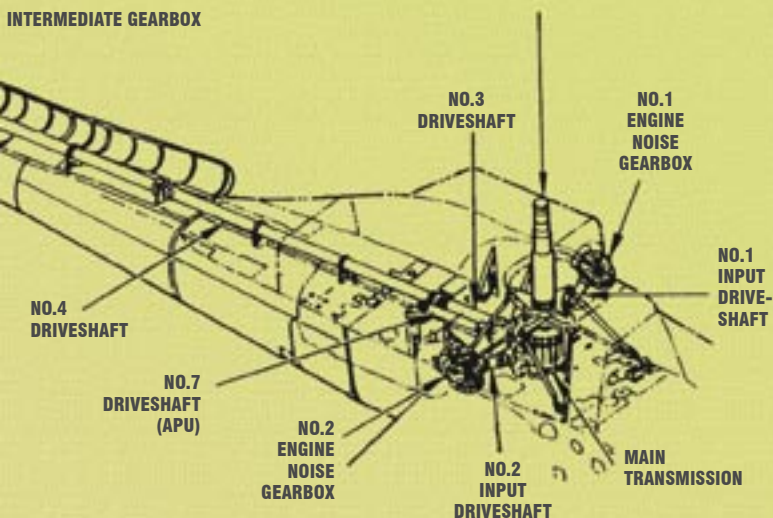
To answer this question, let's take a look at the drive train system of the AH-64. In the figure above, you can see that the number four driveshaft is the second of four driveshafts that transfer engine power to the tail rotor. The driveshaft is a hollow, thin-walled aluminum tube that is lightweight and very strong. The driveshaft is dynamically balanced at the factory to be vibration-free at operating speeds in excess of 4,800 RPM. While turning at such high speeds, the driveshaft is able to transfer up to 550 horsepower to the tail rotor. Slow-motion video of these driveshafts show large amounts of twisting taking place as varying loads are applied. The driveshaft also has to withstand severe vibrations at lower

or Driveshaft

TOR
OX

S DRIVESHAFT

INTERMEDIATE GEARBOX



M52-172



speeds, such as those during run-up.

Is the driveshaft fragile? The answer is yes and no. These driveshafts can withstand many stresses, and usually do so very well. The Apache's drive train has been tested to absorb combat damage and still continue to operate without failure, as indicated in this photo (top, right corner) of a driveshaft that survived a bullet hole while in flight in Iraq.

In normal operation, it is not advisable to take such risks with these aluminum tubes. Small dents and scratches can be the weak point, causing catastrophic in-flight failures.

So what happened? Why did the driveshaft fail? There were no known scratches or dents. The aircraft had been

run up five times the same day prior to the driveshaft failing. Was it the driveshaft's fault?

Accident investigators inspected much of the aircraft's drive train system and found nothing wrong with the driveshaft other than the obvious damage. What they did find was that during the number two engine start sequence, the overriding input drive clutch either failed to engage initially and then suddenly engaged; or the clutch was engaged, suddenly disengaged, and then re-engaged immediately afterward. At any rate, there was damage to the number two engine drive clutch indicating some kind of sudden engagement. This sudden engagement caused a severe

shock to the drive train, causing it to fail at the weakest point.

The 10-foot-long driveshaft was twisted in half approximately 3 feet from the aft end, just in front of the aft anti-flail assembly. The forward anti-flail assembly and the catwalk directly above it contained the forward portion of the driveshaft.

Army Aviators start up and shut down aircraft many times on any given day. Most start cycles are routine and uneventful. However, occasionally a start sequence can have an unexpected ending. ♦

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Investigators' Forum

Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

MAJ Ray Jenkins
U.S. Army Safety Center

When most people think of Army Aviation, helicopters immediately come to mind. What many don't know, however, is that fixed-wing operations are a vital component in accomplishing the Army's mission. One of the most recognizable and versatile airplanes in the Army's fleet is the C-12. Since only a small number of Army Aviators go on to fly these aircraft, training in specialty fields such as maintenance test flights (MTFs) is often scarce. And, just like in the rotary-wing community, accidents happen with even the most experienced fixed-wing aviators at the controls.

The Army doesn't offer a fixed-wing maintenance test pilots' course (MTPC). So, when an MTF has to be performed, the unit commander will designate the "most qualified" aviators and instructor pilots (IPs) as the maintenance test

C-12 and had over 3,900 total flight hours, with 1,500 of those in fixed-wing aircraft.

It was a clear fall day when the CW3—the designated MP—and his co-pilot (who had more than 1,500 hours of flight time) departed the airfield in a C-12 for an area known as "test flight valley." Maintenance had replaced the stall strip on the outer edge of the C-12's wing; this procedure required that an MTF be performed before the aircraft could be released. As part of the MTF, the crew was supposed to stall the aircraft to check for proper installation of the stall strip.

It is important to understand that once the MP begins to stall the aircraft, there are five separate conditions that can occur while checking the aircraft's stall capability. If any one of these conditions occurs, the aircraft is in a stalled mode of flight. These five conditions are: the stall warning horn activates; the aircraft begins to buffet; the aircraft exhibits a lack of control responsiveness; any detected roll; and excessive loss of altitude. Training Circular (TC) 1-218, *Aircrew Training*

C-12 Test Flights: Who Should B

pilots (MPs). These individuals are not required to have completed an MTPC or modification and maintenance course, but they must be designated in writing as MPs and have an MP task list. The newly assigned fixed-wing MPs are then taught the necessary MTF maneuvers by someone already performing the task.

The scenario described above was the case in a fatal C-12 accident last fall. A highly qualified CW3 fixed-wing pilot was designated by the battalion commander to perform MTFs. This CW3 was considered to be the best fixed-wing pilot in the entire brigade and was well liked. He was described as the consummate professional in the

Manual, Utility Airplane C-12, directs that the crew should immediately reduce pitch attitude, apply maximum available power, and complete a go-around at the onset of the stall warning horn. If the crew detects any indication of a buffet before the warning horn speed range's lower limit, they should reduce pitch attitude and, if necessary, apply opposite rudder to stop any roll and then complete a go-around. The crew should never attempt to use ailerons to stop the rolling movement.

The accident crew planned to do four maneuvers to complete the MTF. They climbed to 9,000 feet above ground level (AGL) and contacted approach control for a block of airspace. The

MP was on the controls, and the co-pilot was reading the checklist. After trimming the aircraft the crew began to reduce airspeed, looking for the first indication of a stall. The co-pilot read the parameters at which the stall warning horn should activate, and the MP began the maneuver by reducing power and slowing the aircraft. As the aircraft began to slow, the co-pilot read the airspeed at which the stall horn should activate.

When the stall horn finally activated, the co-pilot didn't state the speed range. A few seconds later the MP said he had the yoke full aft and was waiting to see what the aircraft was going to do. The aircraft stalled completely, rolled upside down over the left wing, and continued to roll into a right-wing-low spin. When the aircraft continued to spin, the MP said he was pushing the nose over to recover. At 5,900 feet AGL the MP asked the co-pilot for an altitude read-out. After the co-pilot stated the altitude the voice recorder, for unknown reasons, stopped recording. The aircraft impacted the ground in a right-wing-low attitude in excess of 120 knots. Both pilots were killed.

This article is written for those pilots who perform MTFs in the C-12, which is not rated for spins. The aircraft's manufacturer claims that recovery from a spin in the C-12 is unlikely. The guidelines in TC 1-218 and the MTF manual are clear as to what indications to look for when stalling the aircraft. If these guidelines are followed, this maneuver can be accomplished safely.

First, the crew must always perform stall checks according to the MTF manual. Since these checks are detailed and have numerous steps, the MP must keep the co-pilot informed of the actions being executed. Stall checks also call for various trim speeds for various configurations. The crew must ensure they have enough altitude when performing stall checks to allow a safe recovery by 4,000 feet AGL.

The Army Safety Center has recommended that a fixed-wing MTPC be established, and also urges that anyone performing an MTF on the C-12 cease the maneuver at the first indication the aircraft has stalled. The loss of an aircraft is unfortunate, but the loss of an aircraft and crew is devastating. Follow the standards, and FLY SAFE! ♦

—MAJ Jenkins is an accident investigator with the Aviation Systems and Accident Investigation Division, U.S. Army Safety Center, DSN 558-9853 (334-255-9853), e-mail ray.jenkins@safetycenter.army.mil.

Editor's note: Several C-12 accidents have been attributed to loss of aircraft control during low-speed flight to a stall condition. Because of the C-12's T-tail design, these aircraft may not manifest the buffeting pitching and rolling characteristics that typically indicate a stall condition in other fixed-wing aircraft. Because of this, pilots may be unaware that their aircraft has stalled. Safety of Flight (SOF) C-12-04-01, C-12 Series Aircraft, Staff Warning System Test, was issued on 13 April 2004. The RC-12 series aircraft will be addressed in a separate SOF to be published in the near future.

e Doing Them?



Letters to the Editor

Keeping Returning Soldiers Safe

I am writing as the mother of a Soldier who recently returned from Operation Iraqi Freedom (OIF). While my son was serving in Iraq, I faithfully corresponded and sent morale-booster packages to him, his squad, his platoon sergeant, and other Soldiers in his platoon. Birthdays, Valentine's Day, Easter, Fourth of July, Halloween, Thanksgiving, and Christmas were some of the events they missed with their families, so we parents laced our letters, cards, and e-mails to them with love, hope, and prayers. We diligently prayed they would come safely home.

Now by the grace of God they are home. For the most part, they're between 21 and 26 years old. They're all young and they've all saved up their hazard pay. They're anxious to get out, be free, make up for lost time, and spend that hazard pay.

Summer's on the way. Although they've not been home for long, six Soldiers (my son included) from one platoon have bought new motorcycles, and I'm sure there are more within the company. One of these Soldiers already has had an accident and is in intensive care as I write this. We don't know if the accident was caused by human error, mechanical problems, lack of training, or lack of experience. I do know that I called my son and asked him to promise not to ride his newly purchased motorcycle again. He gave me that, "Yeah, Mom."

Soldiers had to gain experience beyond their years to survive the dangers they faced during OIF. But that doesn't mean they'll come home knowing how to safely ride a motorcycle.

I believe safety can work—but only if people work together. We, as Soldiers' families and friends, must work together to protect them after they've come home. Why bring them back safely from Iraq only to see them die on their own soil on a motorcycle?

—An Army Mom

Editor's note: The mother who sent this letter recently joined Operation Guardian Angel. The U.S. Army Safety Center supports this program. It is designed to get concerned families, friends, and patriotic Americans involved in helping Soldiers stay safe after they return from OIF. With more than 6,000 new motorcycles on order through AAFES for returning Soldiers, this is an area that desperately needs dedicated Guardian Angels. If you are interested, visit the Guardian Angel Web site at <http://safety.army.mil/index-guardianangel.html>. Why not sign up and help the Army win the War on Accidents?

What About the Non-rated Crewmembers?

Safety awareness has become more prominent, and I feel there is a genuine desire from the Safety Center to reduce accidents and to safeguard our personnel and equipment.

After reading the January 2004 DASAF's Corner, two issues struck me as a shortcoming in our quest to reduce accidents. First, there is a lack of training for our mission briefers (junior officers); and second, there is a lack of integration of non-rated crewmembers in the risk management process. The second paragraph states, "...commanders and aviators are doing everything... to mitigate risk" and "...the risk must be acknowledged and accepted at the right level." For most missions, the commander doesn't get involved if the briefing falls below his level of risk. This is where the system begins to break down.

The regulation for mission briefers (AR 95-1) places a requirement on the chain of command with no provisions or considerations made with respect to experience or background. As I traveled with the Directorate of Evaluation and Standardization (DES), it was evident there was, for the

most part, NO training for briefing officers and, consequently, no standards for training.

Some units were better than others, but essentially if you were listed as a briefer per the regulation, you could brief. However you quickly learned that process via "O-J-T" and trial and error. With the stakes as high as they are, we shouldn't leave something of this importance to chance. Commanders will and should always have the final say, but we should have a product in the toolbox to teach the basics of the briefing process. We talk about the process, but never provide any training on how to actually complete the process. This training could be supplemented and become a common start for everyone.

When looking at accidents, we record each rated crewmember's background, but what about the non-rated crewmembers? For example: the flight engineer or crew chief (rank, total time, time in aircraft), mission briefer (rank, total time, time in aircraft, status D/N PI or NVG PC, etc.), level of risk (low, medium, or high, etc.), and who approved the mission (commander, operations officer, platoon leader, etc., to include their background and experience). I think a historical overview of the entire assessment, management, and briefing process in previous accidents would be enlightening.

In BG Smith's discussion of ways to reduce brownout accidents, I saw no reference to the non-rated crewmembers. I've been a Chinook pilot since 1986, and our Cargo community values our non-rated crewmembers.

I feel we, Army Aviation as a whole, have discounted an important asset. Looking at the numbers, the aircraft that have to land to perform their mission (CH-47 and UH-60) were the ones having the most brownout accidents; this is where we should concentrate our prevention efforts. Building simulators that replicate visual cues is great and will be a welcome training aid, but what about aural cues?

In the Cargo community, the calls from the flight engineer and crew chief are absolutely essential during the landing sequence. In the DASAF's "Aircraft Coordination Training" paragraph, "...66 percent of the Class A accidents ... had lack of crew coordination as a contributing factor." Again, was this only between the pilots, or did it involve the non-rated crewmembers? I might be overly sensitive to the non-rated crewmember issue, but the lack of reference to that segment of our community in our premier aviation publication does not send the message to those crewmembers that they are a valued part of the community. Thank you for listening.

—CW5 Noel C. Seale, CH-47 SP/IE, e-mail noel.seale@us.army.mil

*Editor's note: All crewmembers are a valued part of our community and are extremely important to us. We try to be versatile with our articles in terms of interest and need. Check out page 20 in this edition; we have an article discussing non-rated crewmember issues. **Flightfax** is planning a special "Non-rated Crewmember" edition in the near future. Let me know what you want to see in this special issue by calling DSN 558-9855 (334-255-9855) or e-mail Flightfax@safetycenter.army.mil.*

New Perspective on FOD

CPT Dan Carlson
Los Alamitos AAF, CA

Foreign object debris (FOD) is a significant concern at all airfields. At Los Alamitos Army Airfield (AAF) in Los Alamitos, CA, we recently upgraded our FOD control program with new equipment. Los Alamitos AAF has 4 square miles of property that sits under the Class B shelf of Los Angeles International Airport. Besides Army Aviation assets, this airfield hosts several Department of Defense (DOD) customers to include Air Force One, Marine One, NASA, Air Force C-5s, C-130s, KC-135s, KC-10s, and high performance fighters. The airfield is operated by the California Army National Guard and primarily supports UH-60, UH-1, OH-58, CH-47, and C-12 flights. The airfield has over 2 million square feet of ramp and taxiway space, as well as over 2 miles of runway that are 200 feet wide.

Heavily-used commercial airports and Air Force airfields use expensive high-speed runway sweepers to perform the FOD control function. For several years, Los Alamitos AAF had relied on FOD control personnel ramp walks and a poorly maintained city sweeper that seemed to just push dirt around. Personnel ramp walks are usually done by the maintenance section of the hangar. This method of ramp walking is not ideal, as the mechanics often miss several pieces of FOD because of distractions or talking. This method is also very costly in the long run, averaging some 70 man-hours a month at our facility. Maintainers should instead be spending their time on getting aircraft flying. Additionally, high-speed runway sweepers cost well over \$100,000 and are expensive to maintain. We needed an efficient compromise between the two that would be financially obtainable.

After researching online and at ground support conventions, we found a product

called the “FOD BOSS.” This product comes in squares and is pulled behind a vehicle. It uses friction against the ground to pull the FOD up off the surface, where it is caught in pouches to be dumped later. The company offered a 1-month demonstration period at no charge. We accepted the demo, and upon first usage found the product to be invaluable. The product picked up items such as nails, bolts, sand, and even coins. The product costs just under \$10,000 and was readily available. After a demo our state aviation officer decided to purchase a FOD BOSS for every facility throughout the state, recognizing the cost benefits for maintenance programs.

Here’s an example of the FOD BOSS saving the day (and my career). Los Alamitos AAF recently manned an Air Force mobility exercise. The airfield was the portal for all large cargo and tanker aircraft in the DOD inventory, to include C-5, C-130, KC-10, KC-135, C-141, and C-17 aircraft. We had 50 landings in just 2 days and passed over 2,000 passengers through the terminal area. One particular day, a KC-135 had just landed and called the control tower from taxiway 6. The pilot refused to taxi because of the FOD that had blown on the taxiway. This particular taxiway needed to be widened for this reason, but budgeting has not allowed for it in recent years. In the



heat of the California summer, the dirt is very dry. Between the asphalt areas, the outboard engines of these large aircraft blow loose debris onto the taxiway. This occurs close to our ramp areas, as well as with helicopter traffic repositioning to the dirt pads.

The landing schedule was so tight during this exercise that another C-17 had joined this aircraft. The tower called me on the radio and explained that an additional two aircraft were being sequenced in the Class B airspace, and the KC-135 and C-17 needed to be moved **now!** Upon inspection of the site, I found the area to be in bad shape. Dirt, rocks, and

weeds were lying all over the taxiway. We could have filled wheelbarrows with this much FOD! In the past, if this occurred we would've had to sweep the area with brooms. An area this large (75' X 500') would have taken hours to clean, and in this specific case would have shut down our runways to the incoming Air Force aircraft.

I called our fuel sergeant, who also manages the FOD program, to bring out the FOD BOSS. It has three sweepers that work in conjunction with each other to sweep an area 24 feet wide. Within 5 minutes, we had this area clean enough for the KC-135 to pass. During the next few minutes, the FOD BOSS needed to be emptied. After it was emptied, we cleaned the remaining areas so the C-17 could pass.

While I was standing next to the taxiway staring at the large aircraft waiting to taxi, it was the longest 10 to 15 minutes of my short career here at the airfield. There is no

question the FOD BOSS saved the day. Without this taxiway, the Air Force taxi plan was shot because of our weight-bearing capacity on other taxiways. The remaining aircraft would've had to be diverted to another airport, further unraveling their transportation plans as well as congesting the southern California Class B airspace sequencing plans at FAA TRACON facilities. Thanks to the FOD BOSS, the VIPs on board these aircraft were never aware of the problem, and the mobility exercise went off without a hitch.

The FOD BOSS does have its limitations. It needs a flat surface and is most accurate when driven at 15 mph, but can be used at speeds of up to 25 mph. It cannot get down between cracks or pick up large items that should be picked up by hand. One of the many advantages of this product is that just one sweeper by itself can be pulled under wings and rotor spans by a tug. This allows it to get close to aircraft, where loose tools or small fasteners may lay. It works well even in the rain.

To augment our FOD BOSS program, we chose a street sweeper that was below \$100,000 with adequate suction to pick up FOD while traveling at 5 mph. The company had a sales office locally, and we were able to get a sweeper demo. It has a radio and climate controls necessary for hot summer days while driving at 5 mph or less. This vehicle can pick up standing water and get down into the ramp grounding points in the concrete.

FOD is a never-ending issue at airfields. Whether serving as a joint airfield or strictly for helicopter traffic, FOD knows no boundaries. Thanks to our state aviation leaders in California, we have put our money where our mouth is and made a significant dent in FOD and its effects. We now FOD-sweep the airfield once a week as a practice. The ramps have never been cleaner for a cost of less than \$125,000. This total expenditure will be easily offset by reduced maintenance man-hours and reduced loss or injury as a result of FOD. ♦

—CPT Carlson is the Operations Officer at Los Alamitos AAF. He can be reached by calling DSN 972-2005 (562-795-2005) or e-mail Daniel.Carlson@ca.ngb.army.mil.



Emergency Procedures

and the NON-rated Crewmember

SFC Steven K. Robertson
CH-47 SI, Co G, 140th Avn Regt
California Army National Guard

A CH-47 departed on the second period of a readiness level (RL) progression training flight. The flight training would be conducted at the tactical training area 20 miles to the northeast of the airfield. During the ramp check, the flight engineer (FE) noticed and reported vibrations and unusual noise coming from the aft transmission area.

Moments later the noise and vibrations increased, becoming audible in the cockpit. The FE recommended landing as soon as possible. A landing procedure was initiated; however, before landing, the UTILITY HYDRAULIC PUMP FAULT light on the maintenance panel illuminated. The utility hydraulic pressure began decreasing, and hydraulic fluid began seeping from the lower aft transmission cover. The utility hydraulic pump was replaced, and the aircraft was released for flight.

On another occasion, a CH-47 departed for an instrument flight evaluation. While at cruise altitude prior to the approach, the FE began the second ramp and cabin check. While checking the maintenance panel, the FE observed a slight decrease in the #2 flight control hydraulic fluid level. The FE continued the ramp check and decided to check the fluid quantity again. This time he observed a steady decrease in the fluid level. The FE notified the pilots of a potential leak. The crew discontinued the approach and landed the helicopter at a nearby civilian airport.

During engine shutdown, the FE observed

the aft pylon was covered with hydraulic oil that had leaked from the aft swiveling actuator. A maintenance crew replaced the actuator, and the aircraft returned to home station.

The preceding vignettes describe actions performed by the non-rated crewmember. The problems were discovered before an emergency indication in the cockpit. In the non-rated crewmember training program and in any unit before studying specific –10 emergency procedures, three basic emergency tasks should be taught.

1. Recognize the emergency situation.

While flying (as this comes with experience), if something doesn't sound right or if something doesn't feel right or look right, it can indicate a pending problem. A crewmember may observe fluid seeping or leaking from a component. While there may be no emergency procedure for what was observed, eventually a fluid leak can damage the system or component.

2. Notify the pilot. Timely input of clear and concise statements to the rest of the crew will assist the pilot in the decision-making process, as well as with how to deal with the potential emergency. Some observations may require immediate action steps, such as fire or smoke in the cabin. It is important for the non-rated crewmember to correctly identify the component or system. If a junior non-rated crewmember is undergoing training, it is imperative that during the non-rated crewmember briefing that the senior CE or FE discuss who will respond during an emergency or maintenance malfunction during flight.

3. Recommend a course of action.

Not all maintenance problems or caution lights clearly define a course of action. For instance, in the CH-47, if the BAT SYS MAL (Battery System Malfunction) light illuminates during flight, the pilot using the checklist will reset the BATT CHGR circuit breaker. If the caution light remains on, the pilot will turn off the battery switch on the overhead panel. The non-rated crewmember should know what would cause this light to come on during flight:

- **Overheated battery or charger.**
- **Battery cell imbalance.**
- **Output short.**
- **Open circuit.**

The non-rated crewmember should check the battery area from inside the cabin to see if the structure around the battery compartment is warm to the touch, and also check out the left bubble window to see if there is any smoke coming from the battery compartment or if any fluid is venting from the battery vent tube. If the non-rated crewmember observes any of the previously mentioned items, he should recommend landing as soon as possible due to the nature of a hot NICAD battery.

Any RL 1 crewmember (rated or non-rated) has completed the aircrew coordination course. The proper flow of information to the pilot in command will determine the correct course of action during an emergency. Aircrew standardization and evaluations provide reinforcement in handling emergencies as they occur. Timely execution of input provided by the crewmember can mean the difference between a minor incident and a major accident.

Every crewmember should do their best to review chapter 9 procedures in their aircraft's operator's manual and be familiar with the systems installed on the aircraft. Ask yourself before your next flight, "Do I want to be the person who takes this work for granted, or do I want to be ready and knowledgeable about the piece of equipment I am assigned and trained to operate?" ♦

—SFC Robertson is a CH-47 Standardization Flight Engineer Instructor (SI) at Company G, 140th Aviation Regiment, California Army National Guard, e-mail steven.robertson@ca.ngh.army.mil.



STACOM Communication

MESSAGE
04-02

Emergency Procedure Training

Recent evaluations by the Directorate of Evaluation and Standardization (DES) have revealed some confusion concerning the interpretation of AR 95-1, paragraph 4-8, *Emergency Procedures Training*, and the requirements of 4-8, b(2) as it relates to multi-engine helicopters. Paragraph 4-8, b(1) applies to single-engine helicopter touchdown emergency procedures, but does NOT apply to multi-engine helicopters.

Paragraph 4-8, b(1) states:

"Hydraulics-off, autorotations (except from a hover) and anti-torque touchdown emergency procedures training in single engine helicopters...."

The rationale for this interpretation is based upon the following:

- Multi-engine helicopters cannot be operated with the flight control hydraulics disabled.
- Practice touchdown autorotations are prohibited in Army multi-engine helicopters.
- There are no Aircrew Training Manual procedures for loss of directional control in Army multi-engine helicopters.
- Roll-on landings are normal operating procedures, and AR 95-1 does not require air-to-ground communications or crash rescue equipment on site to practice them.

As always, local commanders may establish more restrictive training requirements if they feel they are necessary. However, don't let paragraph 4-8 of AR 95-1 restrict you from conducting realistic training in Army multi-engine helicopters.

—For more information, contact DES, Fort Rucker, AL, DSN 558-9029 (334-255-9029) or e-mail cameronc@rucker.army.mil.
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ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64



D Model

■ **Class B:** The aircraft's engine recorder showed an overtorque of the #1 engine and transmission of 136 percent for 3 seconds. The overtorque was discovered during the post-flight inspection. No abnormalities or exceedances were reported by the crew during flight.

■ **Class D:** While accelerating to forward flight, the crew heard a loud whining noise and felt a severe vibration in the aircraft. The cockpit began filling up with fumes and smoke as the pilot initiated an approach to an open field. During short final, the APU FIRE audio and warning activated. After landing, the crew activated the APU primary discharge button while the ENGINE 1 FIRE alarm activated. The crew performed an emergency engine shutdown and evacuated the aircraft.

■ **Class D:** The aircrew heard a progressively louder noise coming from the aircraft's transmission area during cruise flight. The noise ended with a loud "bang" followed by the illumination of the APU FIRE light. The pilot in command took the controls and safely landed the aircraft at a

local airfield 2 kilometers away. Post-flight inspection revealed that the #7 driveshaft had sheared at the shaft's APU end.

CH-47



D Model

■ **Class C:** The aircraft was ground-taxiing on an airfield when the main rotor blades contacted low-hanging branches from nearby trees. Five of the six blades were damaged. The damaged blades were replaced on site, and the aircraft returned to its home station.

■ **Class C:** The aircraft's door separated during a maintenance test flight. The door was recovered.

OH-58



A Model

■ **Class C:** Aircraft encountered whiteout conditions during a run-on landing to an approved landing site. The aircraft rolled over on its left side, damaging the main rotor system.

D(I) Model

■ **Class B:** Aircraft landed hard following a perceived engine malfunction, causing damage to the aircraft. No other details were reported.

D(R) Model

■ **Class A:** Aircraft reportedly contacted wires and descended

into a body of water. Both crewmembers were fatally injured in the crash. This mishap is under investigation.

UH-1



H Model

■ **Class C:** A VS-17 panel marker became dislodged from the ground and flew into the aircraft's main rotor system as it was landing to a field site. The aircraft was shut down without further incident.

V Model

■ **Class C:** The aircraft was approximately 3 to 5 feet above ground level during an approach, when a VS-17 panel marker dislodged from the ground and flew into the main rotor system. One rotor blade was damaged, which was suspected to be non-repairable.

UH-60



A Model

■ **Class C:** Damage to the aircraft's tail wheel strut was found during post-flight inspection. Further inspection revealed damage to the trailing edge of one main rotor blade and the ALQ-144, which is suspected to have occurred when the blade struck the ALQ.

■ **Class C:** Shearing damage to the aircraft's tail wheel strut was found on post-flight inspection. The aircraft had performed several

landing iterations just before the inspection.

■ **Class D:** During climb-out, the crew heard a loud noise coming from the aircraft. The crew aborted the flight and returned the aircraft to the local airfield. The aircraft landed uneventfully; but while ground-taxiing, the crew heard another noise. The crew immediately parked the aircraft on the nearest available pad. Maintenance replaced the right-hand landing gear strut and released the aircraft for flight.

L Model

■ **Class D:** The pilot was landing the aircraft from a hover and allowed the aircraft to drift to the right rear. The tail wheel struck the ground and broke the tail wheel pin, allowing the tail wheel yoke to spin 180 degrees. The pilot then over-controlled with the cyclic and caused three main rotor blades to contact the top of the AN/ALQ-144. The right main landing gear contacted the ground and caused a rolling movement. The pilot in command took the controls and brought the aircraft to a controlled hover.

Editor's note: Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410).



Shortcut to Online Safety

Tired of memorizing user IDs and passwords? You can now use the same password for your Army Knowledge Online (AKO) account to access our online Risk Management Information System (RMIS) and Accident Reporting Automation System (ARAS) safety tools.

Can't get an AKO account, but still want to access RMIS? Just register through our new system at **<https://safety.army.mil>** and click on the ARAS banner or the "Sign-in" or "RMIS" buttons at the top of the page.

Need RMIS information immediately? Contact our Help Desk at (334) 255-1390, DSN 558-1390, or e-mail helpdesk@safetycenter.army.mil.